

REMARKS/ARGUMENTS

Claims 7-33 are pending in this application.

Claims 7-33 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamura et al. (US 2003/0107300) in view of Mizusawa (U.S. 6,778,029). Applicant respectfully traverses the rejection of Claims 7-33.

Claim 7 recites:

A piezoelectric electroacoustic transducer comprising:
a substantially square piezoelectric diaphragm arranged to be vibrated in a thickness direction of the diaphragm by applying an alternating signal to lead electrodes thereof;
a casing including a supporting portion disposed on an inner circumference of the casing, the supporting portion supporting an outer circumference of said piezoelectric diaphragm;
first and second terminals that are fixed to said casing so that inner connecting portions are exposed on said inner circumference of the casing; and
conductive adhesives electrically connecting the lead electrodes of the piezoelectric diaphragm and the inner connecting portions of the first and second terminals; wherein
one of said conductive adhesives is arranged between the inner connecting portion of said first terminal and one of the lead electrodes near one corner of said piezoelectric diaphragm;
the other conductive adhesive is arranged between the inner connecting portion of said second terminal and the other lead electrode near another corner of said piezoelectric diaphragm which is adjacent to the one corner of said piezoelectric diaphragm;
the one corner and the another corner of the piezoelectric diaphragm are disposed at opposite ends of one side of the piezoelectric diaphragm; and
the piezoelectric diaphragm and the conductive adhesives are arranged such that the displacement of vibrations of the piezoelectric diaphragm is circular. (emphasis added)

The Examiner alleged that Nakamura et al. teaches all of the features recited in Applicant's Claim 7, except for the feature of one corner and the other corner of the piezoelectric diaphragm being at opposite ends of one side of the piezoelectric

diaphragm, and the feature of the piezoelectric diaphragm and the conductive adhesive are arranged such that the displacement of vibrations of the piezoelectric diaphragm is circular. The Examiner further alleged, "Mizusawa teaches a piezoelectric transducer in which the corner and the another corner of the piezoelectric diaphragm are disposed at opposite ends of one side of the piezoelectric diaphragm." Thus, the Examiner concluded that it would have been obvious "to combine the terminal configuration of Mizusawa with the piezoelectric electroacoustic transducer of Nakamura et al. for the benefit of simplifying the means of connection to the piezoelectric diaphragm by allowing all of the connections to be made at the same end of the device. In addition, it has been held that merely shifting the location of the parts of the device is obvious (*In re Kuhle*, 188 USPQ 7)."

Furthermore, the Examiner alleged "The claim language 'such that the displacement of vibrations of the piezoelectric diaphragm is circular' is functional language, and does not positively recite any structural elements; therefore, as the combination of Nakamura et al. and Mizusawa discloses each of the claimed structural elements, that combination would perform the same functions."

Applicant respectfully disagrees with the Examiner's allegations.

As clearly disclosed in the originally filed specification, the inventors of the present invention discovered that by arranging the conductive adhesives adjacent to corners of the piezoelectric diaphragm that are disposed at opposite ends of one side of the piezoelectric diaphragm, instead of adjacent to corners that are at diagonal positions of the piezoelectric diaphragm, the constraining force of the conductive adhesives on the piezoelectric diaphragm is drastically reduced to thereby enable the piezoelectric diaphragm to be more freely displaced. Due to the reduced constraining force and the more freely displaceable piezoelectric diaphragm, the inventors discovered that the unexpected and advantageous results of the node of vibration being shifted to the outside, the wavelength of the vibrations being lengthened, and the resonant frequency

being lowered. These unexpected and advantageous results arise due to the circular displacement of vibration without distortion that is produced due to the conductive adhesives being arranged adjacent to corners of the piezoelectric diaphragm that are disposed at opposite ends of one side of the piezoelectric diaphragm. See, for example, paragraphs [0020] and [0065]-[0069] of the originally filed specification and Figs. 9A to 10B.

Neither Nakamura et al. nor Mizusawa recognizes any of these unexpected and advantageous results. Thus, Applicant respectfully submits that, contrary to the Examiner's allegations, it would not have been obvious to merely combine the terminal configuration of Mizusawa et al. with the piezoelectric electroacoustic transducer of Nakamura et al. for the benefit of simplifying the means of connection to the piezoelectric diaphragm by allowing all of the connections to be made at the same end of the device.

In view of the unexpected and advantageous results that are obtained by the arrangement of conductive adhesives recited in Applicant's Claims 7, 16 and 25, Applicant respectfully submits that the alleged modification of Nakamura et al. to include conductive adhesives as recited in Applicant's Claims 7, 16, and 25 would have required far more than merely shifting the location of the parts of the device.

In addition, the Examiner alleged that the motivation to combine Mizusawa with Nakamura et al. would have been "for the benefit of simplifying the means of connection to the piezoelectric diaphragm by allowing all of the connections to be made at the same end of the device." However, Mizusawa fails to teach or suggest that providing the terminals 17 along one side of the quartz crystal blank 2 would simplify the means of connection to the planar substrate 11, and the Examiner has failed to explain how or why allowing all of the connections to be made at the same end of the device would be easier than making the connections at the locations shown in Nakamura et al.

Since, as shown in Fig. 1 of Nakamura et al., all four sides of the piezoelectric

diaphragm 1 of Nakamura et al. are equally accessible for connection to the terminals 11a and 12a via the conductive adhesive 14a and 14b, it is entirely unclear how or in what manner the means of connection would be simplified if the connections were made at the same end of the device. Applicant respectfully requests that the Examiner clarify how and in what manner the means of connection would have been simplified.

In the Response to Arguments section on page 9 of the outstanding Office Action, the Examiner alleged, "it would be obvious to combine the teachings of these two references [Nakamura et al. and Mizusawa] as described above for the benefit of simplifying the means of electrically connecting the device, as connections would only need to be made to a single side of the device. This would simplify the means of connection by only needing to extend the inner connections (items 11a and 12a) to one end of the device." Applicant respectfully disagrees.

It is entirely unclear how extending the inner connections to one end or side in the device of Nakamura et al. would simplify the means of connection, as alleged by the Examiner. As clearly shown in Fig. 10 of Nakamura et al., each of the sides and corners of the piezoelectric diaphragm 1 of Nakamura et al. are equally accessible outside of the case 10. Thus, if the device of Nakamura et al. were modified as alleged by the Examiner, the means of connection would, in no way, be simplified. Furthermore, the Examiner has failed to explain why or in what manner extending the inner connections 11a and 12a of Nakamura et al. to one side would simplify the means of electrically connecting the device.

Therefore, Applicant respectfully submits that one of ordinary skill in the art would clearly not have had any reason or motivation to combine the alleged teachings of Mizusawa with Nakamura et al. In fact, such a modification as alleged by the Examiner would provide absolutely no benefit whatsoever.

Accordingly, Applicant respectfully submits that Nakamura et al. and Mizusawa, applied alone or in combination, fail to teach or suggest the unique combination and

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arrangement of features recited in Applicant's Claims 7, 16, and 25.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection of Claim 7 under 35 U.S.C. § 103(a) as being unpatentable over Nakamura et al. in view of Mizusawa.

In view of the foregoing amendments and remarks, Applicant respectfully submits that Claims 7, 16, and 25 are allowable. Claims 10-15, 17-24, and 26-33 depend upon Claims 7, 16, and 25, and are therefore allowable for at least the reasons that Claims 7, 16, and 25 are allowable.

In view of the foregoing amendments and remarks, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are solicited.

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

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